

# Surge Protective Device (SPD) Type Application Considerations

This paper is provided to clarify the use of the different Listed or Recognized Types of Surge Protective Devices (SPDs) that are used in 50 or 60 Hz power circuits not exceeding 1000 V as defined in ANSI/UL 1449.

The SPD Types described below are in accordance (paraphrased from) with UL 1449 Third Edition, as follows:

**Type 1 SPDs (Listed)** – Permanently connected, hard-wired SPDs intended for installation between the secondary of the service transformer and the line side of the main service equipment overcurrent protective device, as well as the load side of the main service equipment (i.e. Type 1's can be installed anywhere within the distribution system). Type 1 SPDs include watt-hour meter socket enclosure type SPDs. Being on the line side of the service disconnect where there are no overcurrent protective devices to protect an SPD, Type 1 SPDs must be listed without the use of an external overcurrent protective device. The Nominal Discharge Current Rating for Type 1 SPDs is either 10kA or 20kA.

**Type 2 SPDs (Listed)** – Permanently connected, hard-wired SPDs intended for installation on the load side of the main service equipment overcurrent protective device. These SPDs may also be installed at the main service equipment, but must be installed on the load side of the main service overcurrent protective device. Type 2 SPDs may or may not require an overcurrent protection device per their NRTL listing. If a specific overcurrent protection is required, the SPD's NRTL listing file and labeling/instructions are required to note the size and type of overcurrent protective device. Note: In some cases the overcurrent protective device used can impact the nominal discharge rating of the SPD. For example, the SPD may have a 10 kA nominal discharge current rating when protected by a 30 Amp circuit breaker and a 20 kA nominal discharge current rating when protected by a different but specific make and model of overcurrent protection device. The Nominal Discharge Current Rating for Type 2 SPDs is 3 kA, 5 kA, 10 kA, or 20 kA.

Some key differences between Type 1 and Type 2 SPDs are:

- External Overcurrent Protection. Type 2 SPDs may require external overcurrent protection or it may be included within the SPD. Type 1 SPDs generally include overcurrent protection within the SPD or other means to satisfy the requirements of the standard; thus, Type 1 SPDs and Type 2 SPDs that do not require external overcurrent protection devices eliminate the potential for installing an incorrectly rated (mismatched) overcurrent protection device with the SPD.

- Nominal Discharge Current Ratings. Available Nominal Discharge Current ( $I_n$ ) ratings of Type 1 SPDs are 10 kA or 20 kA; whereas, Type 2 SPDs may have 3 kA, 5 kA, 10 kA or 20 kA Nominal Discharge Current ratings.
- UL 1283 EMI/RFI Filtering. Some UL 1449 Listed SPDs include filter circuits that have been evaluated as a UL 1283 (Standard for Electromagnetic Interference Filters) filter. These are complimentary UL Listed as a UL 1283 filter and a UL 1449 SPD. By definition and the scope of UL 1283, UL 1283 Listed filters are evaluated for load-side applications only, not line-side applications. Consequently, UL will not complimentary list a Type 1 SPD as a UL 1283 Listed filter. However, a Type 1 SPD might include a UL 1283 filter as a Recognized Component within a Listed Type 1 SPD, which has been fully evaluated for line-side usage. Manufacturers of such products generally offer the identical SPD as a Type 2 UL 1449 Listed SPD with complimentary Listing as a UL 1283 Listed filter.
- Capacitors. Capacitors utilized in Type 1 SPDs may be evaluated for safety differently than in Type 2 SPDs. All capacitors in Type 1 SPD applications are evaluated to UL 810 (Standard for Capacitors). This includes filtering capacitors referenced above in UL 1283 (Standard for Electromagnetic Interference Filters) applications. Capacitors in Type 2 SPDs are evaluated to UL 1414 (Standard for Capacitors and Suppressors for Radio- and Television-Type Appliances) and/or UL 1283 (Standard for Electromagnetic Interference Filters).

**Type 3 SPDs (Listed)** – These SPDs are called, ‘Point of Utilization SPDs’, which are to be installed at a minimum conductor length of 10 meter (30 feet) from the electrical service panel unless they are evaluated at Type 2 SPDs (that is, they receive a Nominal Discharge Current Rating of 3 kA minimum). Typically, these are cord-connected surge strips, direct plug-in SPDs, or receptacle-type SPDs installed at the utilization equipment being protected (i.e. computers, copy machines, etc.).

**Type 1, 2, 3 Component Assembly SPDs (Component Recognized)** – These SPDs are intended to be factory installed into electrical distribution equipment or end-use equipment. These are Recognized Component SPDs evaluated for use in Type 1, 2 or 3 SPD applications. Such component SPDs must pass all the same electrical safety failure tests as listed Type 1, 2 or 3 SPDs. While these SPDs are 100% compliant from a safety failure testing point of view, these Type 1, 2 and 3 component assembly SPDs have conditions of acceptability such as exposed terminals or other mechanical construction that requires them to be installed or housed within a listed assembly to provide protection from exposure to live parts or other requirements. These Type 1, 2 or 3 Recognized Component SPDs should not be confused with ANSI/UL 1449-2006 Type 4 Component Assemblies and Type 5 discrete SPD components that require additional components (possibly safety disconnectors), design and testing in order to be used as a complete surge protective device.

**Type 4 Component Assembly SPD (Component Recognized)** — These component assemblies consist of one or more Type 5 SPD components together with a disconnect (integral or external) or a means of complying with the limited current tests in UL 1449, Section 39.4. These are incomplete SPD assemblies, which typically are installed in listed end-use products as long as all conditions of acceptability are met. These Type 4 component assemblies are incomplete as an SPD, require further evaluation and are not permitted to be installed in the field as a stand-alone SPD. Often, these devices require additional overcurrent protection.

**Type 5 SPD (Component Recognized)** – Discrete component surge protection devices, such as MOVs that may be mounted on a printed wiring board, connected by its leads or provided within an enclosure with mounting means and wiring terminations. These Type 5 SPD components are incomplete as an SPD, require further evaluation and are not permitted to be installed in the field as a stand-alone SPD. Type 5 SPDs are generally the components used in the design and construction of complete SPDs or other SPD assemblies.